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this phase of crystallography in English and American text-books, and in those in which the subjects are treated at all the discussion is so poorly developed as to be practically valueless for teaching purposes.

While the elements of physical crystallography are merely touched upon in the volume under review, the development of the discussion is logical and connected, and at every step the correlation between physical and geometrical symmetry is emphasized.

The most notable advance made in this new edition, however, is in the chapter dealing with the relations between the physical properties of crystals and their chemical composition. This portion of the book now occupies 26 pages, whereas in the earlier edition it occupied only 11 pages. Morphotropism, homomorphism, isomorphism, eutropism, polymorphism and isopolymorphism are illustrated by tables of substances exhibiting these properties, and the terms are explained in sufficient detail to serve the purpose of introducing the student into the fascinating field of chemical crystallography.

In all respects the volume will serve as an excellent text-book in elementary courses in crystallography. It is more comprehensive than the usual text-book pretending to deal with the subject, as it covers the field in all its aspects. The student is shown that crystals are not merely bodies possessing characteristic forms, but that they are bodies which also possess characteristic physical properties, and that such a close relationship exists between their geometrical, their physical and their chemical properties that these characters must be regarded as being connected genetically. That crystallography is a rational science and not merely a descriptive one is the impression left by the reading of the book. It is an impression to be greatly desired of American students, who are too apt to look upon crystals from the geometrical standpoint only.

The objectionable feature of the book is its lack of references. While this omission may be argued as possibly on the whole desirable in most elementary science text-books, in a text-book on general crystallography the omis-

sion is extremely unfortunate. The literature of physical crystallography is so widely scattered that a guide to the most important articles in this branch of the subject would certainly be convenient to the user of the volume. To advanced students—and that is the class to which Dr. Linck's book will most appeal, in America at least—a guide is absolutely necessary if the study is to be followed with any seriousness. It is to be hoped that in the next edition the author will insert at least a few references which will indicate where the most important discussions in physical and chemical crystallography may be found.

W. S. BAYLEY

*The Cell as the Unit of Life.* By the late ALLAN MACFADYEN, M.D., B.Sc. Edited by R. TANNER HEWLETT, M.D., etc. Pp. 381 and biographical notice. London, J. and A. Churchill; Philadelphia, P. Blakiston's Son & Co. 1908. \$3.00 net.

The lectures brought together in this volume were delivered by the late Dr. Allan Macfadyen at the Royal Institution, London, during the years 1899-1902, and have been edited and published by Professor Hewlett as offering "some memento of a life full of promise and cut off all too soon." The difficult task, undertaken *con amore*, has been well performed by the editor, and a very readable and acceptable, although from its very nature somewhat out-of-date, "introduction to biology" lies before us.

The work is divided into sections, the first of which, under the caption *The Cell as the Unit of Life*, consists of five lectures on rather elementary biology in which a captious critic might find abundant material to feed his flame; if a morphologist he would take exception to such slips as that which speaks of the "Polar Body or Centrosome" (p. 57), or if a protozoologist to false impressions given by statements such as that on page 79 to the effect that always in feeding, "the *Amœba* seeks out and selects the alga cell." The second section, under the heading *Cellular Physiology*, is misleading in that little or nothing is said about physiology of the cell, the lec-

tures being devoted almost exclusively to fermentation and the actions of enzymes external to the cell and not intra-cellular activities. The cytologist looks here in vain for information regarding constructive and destructive metabolism, oxidation, etc., in the cell. He finds, however, an excellent and clear exposition of the kinds of ferments and of their importance in digestion in animals and plants, and in the first lecture of this second set he finds a most excellent illustration of the cost in labor of ascertaining a single scientific fact, a concise history of the development during the last two hundred years of our knowledge of fermentation being given. The third section of three lectures entitled Recent Methods and Results in Biological Inquiry, and the last section of four lectures on Toxins and Antitoxins, contain much repetition of the earlier lectures, but we find here a valuable elaboration of the lines of research in a field where Dr. Macfadyen was familiar with every inch of the ground. Here is an excellent summary of the effects of microorganisms as agents of disease and of immunity to and prevention of disease, all as understood at the time the lectures were written and well serving as a basis for those who would study the modern developments of these important lines of biological research.

G. N. C.

#### SCIENTIFIC JOURNALS AND ARTICLES

*The Journal of Experimental Zoology*, Vol. VI., No. 2 (February, 1909), contains the following papers: "Studies on Chromosomes, V., The Chromosome-groups of Metapodius, A Contribution to the Hypothesis of the Genetic Continuity of the Chromosomes," by Edmund B. Wilson. This contains a detailed account of the "supernumerary chromosomes," which form a specific class and vary in number in different individuals of the same species. The facts are shown to form a strong support to the general theory of the genetic continuity of the chromosomes, of which a general discussion is given. "The Effects of Desiccation on the Rotifer, *Philodina roseola*," by Merkel Henry Jacobs. The old question of the possibility of revival of rotifers after a

more or less protracted desiccation is again taken up, and as a result of numerous experiments the older view that recovery is possible after a true desiccation is confirmed and the newer one that the animal at the time of drying is protected by a water-proof cyst is shown to be based on insufficient evidence. In addition, it is shown that the process of drying serves as a stimulus to reproductive activity, a definite relation existing between the periods of drying and those of egg laying. "Protozoan Studies," by J. F. McClendon. *Amœbæ* do not respond to minutely localized mechanical stimulation unless this be repeated at short intervals of time. By chemical stimulation it was found that the stimulus traveled through the *Amœba* at a rate probably faster than the movement of the fastest ions in aqueous solution. The movement of this stimulus might be compared to the nervous impulse, save that not being confined to a nerve fiber it spreads in all directions. Experiments suggested the following hypothesis of food taking by the *Amœba*: External chemical and physical processes cause a hardening and shrinking of the surface protoplasm, thus forming the ectosarc. Internal processes cause a liquefying of the protoplasm, thus forming the endosarc. Unstable equilibrium between these two sets of processes causes amœboid movements. A protoplasmic food body near the *Amœba* protects it locally from external processes and thus causes the *Amœba* to bulge out toward the food. That spot on the *Amœba* that touches the food is stimulated, hardens and ceases to advance. Therefore lateral pseudopodia are formed and surround the food. *Paramecia* were centrifuged for periods of time up to one week. The nuclei, chromatin and other heavy substances were precipitated, but returned to their normal positions in about the length of time during which they had been centrifuged. The negative geotropism returned simultaneously with return of these substances. Centrifuging stimulated division. Centrifuging produced abnormalities and these were not transmitted to both products of binary fission. *Paramecium aurelia* formed membranous cysts and while in them often absorbed its own anterior or